PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2000-293142

(43)Date of publication of application : 20.10.2000

(51)Int.Cl. G09G 3/36
G02F 1/133
G09G 3/20

(21)Application number : 11-103406

(22)Date of filing : 09.04.1999

(71)Applicant : CASIO COMPUT CO LTD

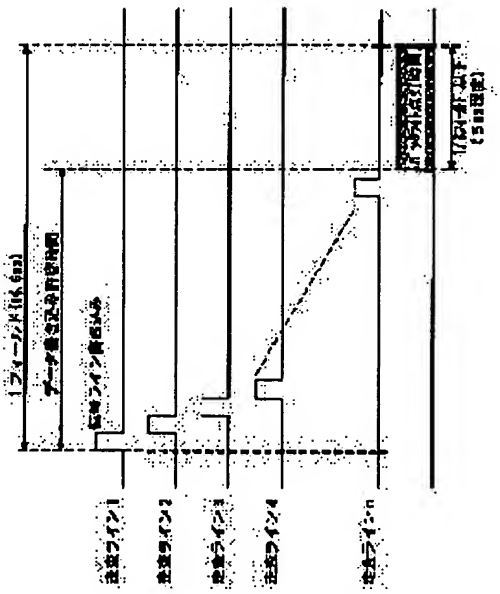
(72)Inventor : SHIOTANI MASAHARU

(54) LIQUID CRYSTAL DISPLAY DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To improve animation display capability by displaying a picture signal written in a liquid crystal display panel by a scanning driver and a signal driver by lighting a back light only in a prescribed time within one field period.

SOLUTION: A scanning line 1 at the uppermost part of a liquid crystal display panel is selected by a scanning driver, and then prescribed display data are impressed to a signal line by a signal driver so that the display data can be written in each liquid crystal pixel in the first line. Afterwards, scanning lines 2, 3, 4,..., n are successively scanned and selected, and the display data are written through the signal line in each liquid crystal pixel in the 2nd, 3rd, 4th,..., line. Then, after the writing of the display data is ended, a back light is turned into a lighted state from the back face side of the liquid crystal display panel in a state that the display data written in all the liquid crystal pixels are held so that the liquid crystal display panel can be irradiated with irradiating lights, and the display data can be emission displayed in the residual 1/3 of one field period or less.



LEGAL STATUS

[Date of request for examination] 02.12.2003

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

CLAIMS

[Claim(s)]
[Claim 1] The liquid crystal display panel by which two or more liquid crystal pixels were arranged in the shape of a matrix Two or more scan lines and signal lines which connect said two or more liquid crystal pixels in a line writing direction and the direction of a train The drive control circuit which supplies the control signal which controls actuation of the scan driver which is made to carry out the sequential shift of the predetermined scan signal, impresses, and scans said scan line sequentially, the signal driver which impresses a picture signal to said signal line, the back light which irradiates exposure light from the tooth-back side of said liquid crystal display panel, the inverter circuit which carries out the alternating current drive of said back light, and a said scan driver, a signal driver and an inverter circuit It is the liquid crystal display equipped with the above, and said drive control circuit is characterized by only for the predetermined time amount within 1 field period turning on said back light, and displaying the picture signal written in said liquid crystal display panel by said scan driver and the signal driver.
[Claim 2] Said predetermined time amount which displays the picture signal written in said liquid crystal display panel is a liquid crystal display according to claim 1 characterized by being set as uniform time amount length and timing about said all scan lines scanned at said 1 field period.
[Claim 3] Said predetermined time amount which displays the picture signal written in said liquid crystal display panel is a liquid crystal display according to claim 2 characterized by being set up so that it may be in agreement with the lighting time amount of said back light.
[Claim 4] Said drive control circuit is a liquid crystal display according to claim 3 characterized by writing in all the picture signals for one screen at said liquid crystal display panel at periods other than said predetermined time amount within said 1 field period.
[Claim 5] Said predetermined time amount which displays the picture signal written in said liquid crystal display panel is a liquid crystal display according to claim 1 to 4 characterized by the thing of said 1 field period set in general or less to 1/3.
[Claim 6] Said predetermined time amount which displays the picture signal written in said liquid crystal display panel is a liquid crystal display according to claim 1 to 4 characterized by being set in general as 5 or less msecs.
[Claim 7] Said back light is a liquid crystal display according to claim 1 to 6 characterized by having the device which changes and controls the exposure of the exposure light to said liquid crystal display panel, and a cut off state based on said control signal supplied from said drive control circuit.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] Especially this invention relates to the liquid crystal display which raised the display capacity at the time of displaying a dynamic image on a liquid crystal screen, and display quality about a liquid crystal display.
[0002]
[Description of the Prior Art] In recent years, in connection with the rapid progress to an information society, the spread of liquid crystal displays is remarkable as substitution of monitors, such as a display of television or a personal computer (it is hereafter written as a personal computer), and a video camera, or a large-sized display. It is expected that it becomes the mainstream of a future display since the liquid crystal display (LCD) has the various descriptions, such as a thin shape, a light weight, and a low power, as compared with the Braun tube (CRT) which was the mainstream of a display conventionally. On the other hand, while a personal computer is begun and information machines and equipment, such as a video camera, spread rapidly with arrival of multimedia age, the object of information processing becomes more variegated and the ratio which deals with not only a static image but a dynamic image is increasing rapidly. While the technique corresponding to big-screen-izing, highly-minute-izing, and quality improvement in a liquid crystal display is searched for by such technical background, according to it, the animation display engine performance (capacity) equivalent to CRT is called for.
[0003] Below, the animation display capacity in conventional CRT and a conventional liquid crystal display is explained with reference to a drawing. In addition, the comparison of such animation display capacity is indicated in detail by the Institute of Electronics and Communication Engineers technical report "examination about the quality of an animation of the hold luminescence mold display by 8X CRT" (TECHNICAL PERORT OF IEICE.EID96-4 (1996-06) p.19-p.26), for example. Drawing 3 is drawing showing the relation between animation display capacity and means of displaying. Generally, as an image display method, the impulse mold [drawing 3 (a)], the hold mold [drawing 3 (b)], and the characteristic mold [drawing 3 (c)] are known, and the means of displaying of a liquid crystal display is classified into a characteristic mold.
[0004] A characteristic mold is means of displaying which in the case of the liquid crystal display of a transparency mold scans a scan line (it is also called a gate line.) in order caudad from the upper part of a screen, and writes the indicative data (picture signal) in the liquid crystal pixel in order where a back light is always turned on, as shown in drawing 3 (c). Here, since the liquid crystal pixel is constituted by capacity, the signal level of the indicative data impressed to the liquid crystal pixel is accumulated as a charge, and an indicative data is displayed on a liquid crystal display panel by [fixed] carrying out time amount maintenance. Such a display action is repeated also in the next field. Since the charge accumulated in pixel capacity at this time is gradually decreased with the passage of time within 1 field period, display lightness (brightness) is changed. Thus, the means of displaying which the maintenance condition of an indicative data decreases gradually exponentially is called the characteristic mold.
[0005] On the other hand, as shown in drawing 3 (a), an impulse mold is means of displaying which only a specific short time within 1 field period makes turn on the display screen, and is represented by CRT. By in the case of CRT, writing an indicative data in a fluorescent substance, and only very short time amount's emitting light, using the after-image effectiveness of human being's vision, and repeating after that the actuation which brightness decreases gradually, this method is the phase where each indicative data disappears, and expresses the motion with the continuous image reflected in human being's eyes as an after-image. Namely, when the field changes, the indicative data of the front field will already be disappeared. In addition, the means of displaying of a hold mold is a method held and displayed, without the once written-in indicative data decreasing almost as shown in drawing 3 (b), and it is represented by the plasma display panel (PDP) etc.
[0006] As mentioned above, in the means of displaying of an impulse mold, by making it not remain on the screen of the next field, the indicative data of the front field is recognized as an after-image only in human being's vision, and can

also see,the early animation of a motion without sense of incongruity. Therefore, the impulse mold is most suitable among each means of displaying mentioned above as a method which displays an animation, and it excels in animation display capacity so that clearly also from the display in CRT (television).

[0007]

[Problem(s) to be Solved by the Invention] Since the means of displaying of a characteristic mold is adopted in the liquid crystal display as shown in drawing 4 </A> as mentioned above, back light light is always irradiated. And an indicative data It is scanned sequentially from the upper scan line of a liquid crystal display panel (scan lines 1, 2, and 3, --, n), and writing is performed to a liquid crystal pixel, and shortly after writing is completed, a display display condition is held (the write-in (time amount n) -> display time (n)). Therefore, a screen display will always be rewritten one by one downward from on the screen, and especially, by the early animation of a motion, it is recognized as the image of the front field and the image of the next field lapping and appearing, and has the problem of sensing sense of incongruity to which coma delivery of the image is carried out. Then, this invention solves the problem mentioned above and aims at offering the liquid crystal display excellent in animation display capacity.

[0008]

[Means for Solving the Problem] The liquid crystal display panel by which, as for the liquid crystal display according to claim 1, two or more liquid crystal pixels were arranged in the shape of a matrix, Two or more scan lines and signal lines which connect said two or more liquid crystal pixels in a line writing direction and the direction of a train, The scan driver which is made to carry out the sequential shift of the predetermined scan signal, impresses, and scans said scan line sequentially, The signal driver which impresses a picture signal to said signal line, and the back light which irradiates exposure light from the tooth-back side of said liquid crystal display panel, In the liquid crystal display equipped with the inverter circuit which carries out the alternating current drive of said back light, and the drive control circuit which supplies the control signal which controls actuation of said scan driver, a signal driver, and an inverter circuit Said drive control circuit is characterized by only for the predetermined time amount within 1 field period turning on said back light, and displaying the picture signal written in said liquid crystal display panel by said scan driver and the signal driver.

[0009] Moreover, said predetermined time amount as which a liquid crystal display according to claim 2 displays the picture signal written in said liquid crystal display panel in the liquid crystal display according to claim 1 is characterized by being set as uniform time amount length and timing about said all scan lines scanned at said 1 field period. Moreover, a liquid crystal display according to claim 3 is set to a liquid crystal display according to claim 2. Said predetermined time amount which displays the picture signal written in said liquid crystal display panel is characterized by being set up so that it may be in agreement with the lighting time amount of said back light. Moreover, a liquid crystal display according to claim 4 is set to a liquid crystal display according to claim 3. Said drive control circuit is characterized by writing in all the picture signals for one screen at said liquid crystal display panel at periods other than said predetermined time amount within said 1 field period.

[0010] Furthermore, said predetermined time amount as which a liquid crystal display according to claim 5 displays the picture signal written in said liquid crystal display panel in a liquid crystal display according to claim 1 to 4 is characterized by the thing of said 1 field period set in general or less to 1/3. Moreover, said predetermined time amount as which a liquid crystal display according to claim 6 displays the picture signal written in said liquid crystal display panel in the liquid crystal display according to claim 1 to 4 is characterized by being set in general as 5 or less msecs. And a liquid crystal display according to claim 7 is characterized by said back light having the device which changes and controls the exposure of the exposure light to said liquid crystal display panel, and a cut off state based on said control signal supplied from said drive control circuit in a liquid crystal display according to claim 1 to 6.

[0011] namely, the liquid crystal display concerning this invention, if it is The time amount (luminescence authorization time amount) which turns on a back light and displays an indicative data (picture signal) It sets to below 1/3 (about 5 msec(s)) in general. 1 field period (1 / 60 seconds = 16.6msec) -- Moreover, make luminescence authorization time amount in agreement to all scan lines, and luminescence authorization time amount and the lighting time amount of a back light are made in agreement. Moreover, it is characterized by having the device which writes the indicative data for one screen in all liquid crystal pixels in field periods other than luminescence authorization time amount, and controls the lighting condition of a back light. Therefore, in two thirds of the time amount of 1 field period, only the writing of the indicative data to a liquid crystal pixel is performed (indicative-data write-in actuation), and the display of the indicative data by which the putting-out-lights condition was held and, as for the back light, the back light was subsequently written in it as a lighting condition by the 1/3 or less remaining time amount of 1 field period is performed (panel luminescence display action). By repeating the above display action for every field, intermittent means of displaying (impulse mold) is realized, and animation display capacity can be raised.

[0012]

[Embodiment of the Invention] The gestalt of operation of the liquid crystal display concerning this invention is

explained with reference to a drawing. Drawing 1 is the outline block diagram showing 1 operation gestalt of the liquid crystal display concerning this invention. drawing 1 -- setting -- 10 -- a liquid crystal display panel and 20 -- a signal driver and 30 -- for reversal amplifier and 60, as for common signal drive amplifier and 80, a LCD controller (drive control circuit) and 70 are [a scan driver and 40 / a RGB decoder and 50 / a back light and 90] an inverter circuit and a back light control circuit.

[0013] Each above-mentioned configuration is as follows [an outline]. The pixel electrode with which the liquid crystal display panel 10 has been arranged in the shape of a matrix, and the thin film transistor by which the source was connected to the pixel electrode (it is written as TFT below Thin Film Transistor;.), The scan line which extended to the line writing direction of a matrix and was connected to the gate of two or more TFT(s), and the signal line which extended in the direction of a train of a matrix and was connected to the source of two or more TFT(s) (it is also called a source line.) The common electrode with which the common signal Vcom which a pixel electrode is countered, and it is arranged and is mentioned later is impressed (it is also called a counterelectrode.) It has the liquid crystal with which it filled up between the pixel electrode and the common electrode, and is constituted.

[0014] Each signal line is connected to the signal driver 20, based on a level control signal, predetermined image data is memorized per one line, and sequential supply of the corresponding graphic display signal is carried out at each signal line. Moreover, each scan line is connected to the scan driver 30, based on a perpendicular control signal, sequential impression of the scan signal is carried out, it considers as a selection condition in a scan line, and the electrical potential difference of the graphic display signal supplied at the above-mentioned signal line is impressed to the pixel electrode of the location which crosses with the above-mentioned signal line. While supplying the RGB decoder 40 and the reversal amplifier 50 to the LCD controller 60 which extracts a perpendicular (V), and the clock signal and synchronizing signal (CSY) of a horizontal (H) from a video signal, and is mentioned later Each chrominance signal of the red (R) and green (G) which are contained in a video signal based on the field / Rhine reversal signal FRP outputted from the LCD controller 60, and blue (B) (it is hereafter called an RGB code.) It extracts, for example, changes into the digital RGB code of 8-bit each width of face, and a RGB reversal signal is supplied to the signal driver 20.

[0015] The LCD controller 60 generates above-mentioned field / Rhine reversal signal FRP based on the level clock signal (H), perpendicular clock signal (V), and synchronizing signal (CSY) which are supplied from the RGB decoder 40. While outputting to the reversal amplifier 50, by generating a level control signal and a perpendicular control signal, and supplying the signal driver 20 and the scan driver 30, a signal level is impressed to a pixel electrode to predetermined timing, and control which writes an indicative data in the liquid crystal display panel 10 is performed. The common signal drive amplifier 70 generates and outputs the common signal Vcom for driving the common potential impressed to the common electrode of the liquid crystal display panel 10 based on the field / Rhine reversal signal FRP outputted from the LCD controller 60 mentioned above.

[0016] A back light 80 is the linear light source of the cold cathode line fluorescent lamp arranged along the end side of a light guide plate (illustration is omitted) established in the tooth-back side of the liquid crystal display panel 10, and emits light to predetermined timing in the exposure light of predetermined brightness based on the alternating voltage for a drive supplied from the inverter circuit and the back light control circuit 90 mentioned later. Based on the back light control signal generated and outputted by the LCD controller 50, an inverter circuit and the back light control circuit 90 control actuation of an inverter circuit, and controls the lighting condition of a back light 80. Here, the back light control signal outputted from the LCD controller 60 is generated as a signal which synchronizes with write-in actuation of the indicative data based on the signal driver 20 and the scan driver 30 which were mentioned above, and is supplied to an inverter circuit and the back light control circuit 90. About the concrete control approach, it mentions later.

[0017] Next, concrete actuation of the liquid crystal display concerning this operation gestalt is explained with reference to a drawing. Drawing 2 is a timing diagram which shows actuation of the liquid crystal display concerning this operation gestalt.

(Indicative-data write-in actuation) All the indicative datas for one screen are first written in two thirds of the time amount (data write-in allowed time) of 1 field period at all liquid crystal pixels. That is, as shown in drawing 2 , an indicative data is written in each liquid crystal pixel of the 1st line by choosing the scan line 1 of the maximum upper part of the liquid crystal display panel 10 by the scan driver 30, and subsequently impressing a predetermined indicative data to a signal line by the signal driver 20. Hereafter, sequential-scanning Rhine 2, 3, and 4, --, n are scanned and chosen, and an indicative data is written in 2, 3, 4, --, each liquid crystal pixel of the n-th line through a signal line. Here, all the indicative datas written in data write-in allowed time are held with the pixel capacity which constitutes a liquid crystal pixel until 1 field period expires. Moreover, in data write-in allowed time, the back light 80 is held at the condition that it is held at the putting-out-lights condition, or exposure light was intercepted.

[0018] (Panel luminescence display action) After ending the writing of an indicative data in data write-in allowed time, where the indicative data written in all liquid crystal pixels is held, by changing a back light 80 into a lighting condition

from the tooth-back side of the liquid crystal display panel 10, exposure light is irradiated and a luminescence display is carried out to the 1/3 or less remaining time amount (luminescence authorization time amount) of 1 field period. That is, in the 1 field, the time amount length and lighting timing of lighting time amount of a back light 80 are equalized to all scan lines. Thus, since image display based on an indicative data is performed momentarily and the same indicative-data write-in actuation and the same panel luminescence display action are repeated also in the subsequent fields, intermittent image display is realized and only 1/3 or less time amount of 1 field period can acquire the after-image effectiveness equivalent to the means of displaying of an impulse mold. Therefore, as shown in the conventional technique, even if it is the case where a dynamic image is displayed, the image of the front field and the image of the next field lapping, and being recognized can be lost, and animation display capacity can be raised.

[0019] Next, the data write-in allowed time which specifies the indicative-data write-in actuation in this operation gestalt, and the luminescence authorization time amount which specifies a panel luminescence display action are explained. As mentioned above, in this operation gestalt, the case where set up two thirds of the time amount of 1 field period, and 1/3 or less time amount of 1 field period was set up as luminescence authorization time amount as data write-in allowed time was explained. Such each operating time is deeply related to human being's vision, as mentioned above. That is, generally, the response time of human being's eyes needs to carry out the display drive of the 1 field period by 5msec(s) (200fps), in order to realize the movie display which does not have sense of incongruity in the liquid crystal display concerning the conventional technique since it is called 5msec extent. Then, in this invention, by performing write-in control of an indicative data, and lighting control of a back light, 1 field period realizes the means of displaying of an impulse mold using the after-image effectiveness of human being's vision, when only 1/3 or less time amount (in general 5 or less msecs) for 1 / 60 seconds (about 16.6 msec(s)) turns on a back light and indicates the indicative data by luminescence.

[0020] In addition, in the liquid crystal display concerning this operation gestalt, in order to realize motion control as shown in drawing 2 , it is desirable to use high-speed lighting applied in the liquid crystal display of for example, a field sequential drive method as a configuration of a back light 80 and the thing excellent in high-speed responsibility. Moreover, you may have the shutter device which can change and control the exposure of the exposure light of a back light 80, and a cut off state by the high speed of 5msec extent as other configurations. Also in which configuration, it is controlled by the back light control circuit 90 to change a back light 80 from the time of going through two thirds of the time amount of 1 field period, or the time of the writing to all the liquid crystal pixels of all indicative datas being completed to a lighting condition synchronizing with write-in actuation of the indicative data based on the signal driver 20 and the scan driver 30 which are controlled by the LCD controller 60. In addition, in order to obtain display brightness comparable as the display brightness by the conventional means of displaying according to this operation gestalt, when the same liquid crystal display panel is used, it is needed to make the power which needs to raise the brightness of a back light at least 3 times, therefore is supplied to a back light increase to 3 or more times. Moreover, although the control which carries out drawing speed of an indicative data early is needed in order to shorten the write-in period of an indicative data to two thirds of the time amount of 1 field period, it is desirable to have the image memory for once storing all the indicative datas for one screen, changing into the frequency corresponding to the above-mentioned write-in actuation, and supplying the signal driver 20 etc.

[0021]

[Effect of the Invention] According to invention according to claim 1 or 4, it sets to a liquid crystal display. In two thirds of the time amount (data write-in allowed time) of 1 field period Only the writing of all the indicative datas for one screen is performed on a liquid crystal display panel. Subsequently by the 1/3 or less remaining time amount (luminescence authorization time amount) of 1 field period Since the means of displaying of an impulse mold is realized also in a liquid crystal display by performing only the luminescence display of the indicative data in which the back light was written as a lighting condition, animation display capacity can be raised. About all the scan lines scanned at 1 field period, since the luminescence authorization time amount which displays the picture signal written in the liquid crystal display panel according to invention according to claim 2 or 3 can indicate all the indicative datas by luminescence at coincidence by setting up so that it may be set as uniform time amount length and timing and may be in agreement with the lighting time amount of a back light, it can realize the display of an intermittent short time as well as the display by the motion-picture film continuously. Therefore, as compared with CRT which performs the scan display by the electron gun, animation display capacity can be raised further.

[0022] According to invention according to claim 5 or 6, the luminescence authorization time amount which performs the luminescence display of the indicative data written in the liquid crystal display panel by making a back light into a lighting condition Since [of 1 field period] the after-image effectiveness of human being's vision can be used in general 1/3 or less and by setting it as 5 or less msecs in general, Sense of incongruity in the conventional liquid crystal display to which coma delivery of the image is carried out can be prevented, and animation display capacity can be raised. According to invention according to claim 7, and as a configuration of a back light By having the device which

changes the exposure of the exposure light to a liquid crystal display panel, and a cut off state at high speed, and controls them based on the back light control signal supplied from a LCD controller 1 field period -- in general, 1/3 or less and since it can make it able to respond to the luminescence authorization time amount of 5 or less msecs in general and the luminescence display of an indicative data can be realized, the means of displaying of an impulse mold is realizable good.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention] Especially this invention relates to the liquid crystal display which raised the display capacity at the time of displaying a dynamic image on a liquid crystal screen, and display quality about a liquid crystal display.

[Translation done.]

PRIOR ART

[Description of the Prior Art] In recent years, in connection with the rapid progress to an information society, the spread of liquid crystal displays is remarkable as substitution of monitors, such as a display of television or a personal computer (it is hereafter written as a personal computer), and a video camera, or a large-sized display. It is expected that it becomes the mainstream of a future display since the liquid crystal display (LCD) has the various descriptions, such as a thin shape, a light weight, and a low power, as compared with the Braun tube (CRT) which was the mainstream of a display conventionally. On the other hand, while a personal computer is begun and information machines and equipment, such as a video camera, spread rapidly with arrival of multimedia age, the object of information processing becomes more variegated and the ratio which deals with not only a static image but a dynamic image is increasing rapidly. While the technique corresponding to big-screen-izing, highly-minute-izing, and quality improvement in a liquid crystal display is searched for by such technical background, according to it, the animation display engine performance (capacity) equivalent to CRT is called for.

[0003] Below, the animation display capacity in conventional CRT and a conventional liquid crystal display is explained with reference to a drawing. In addition, the comparison of such animation display capacity is indicated in detail by the Institute of Electronics and Communication Engineers technical report "examination about the quality of an animation of the hold luminescence mold display by 8X CRT" (TECHNICAL PERORT OF IEICE.EID96-4 (1996-06) p.19-p.26), for example. Drawing 3 is drawing showing the relation between animation display capacity and means of displaying. Generally, as an image display method, the impulse mold [drawing 3 (a)], the hold mold [drawing 3 (b)], and the characteristic mold [drawing 3 (c)] are known, and the means of displaying of a liquid crystal display is classified into a characteristic mold.

[0004] A characteristic mold is means of displaying which in the case of the liquid crystal display of a transparency mold scans a scan line (it is also called a gate line.) in order caudad from the upper part of a screen, and writes the indicative data (picture signal) in the liquid crystal pixel in order where a back light is always turned on, as shown in drawing 3 (c). Here, since the liquid crystal pixel is constituted by capacity, the signal level of the indicative data impressed to the liquid crystal pixel is accumulated as a charge, and an indicative data is displayed on a liquid crystal display panel by [fixed] carrying out time amount maintenance. Such a display action is repeated also in the next field. Since the charge accumulated in pixel capacity at this time is gradually decreased with the passage of time within 1 field period, display lightness (brightness) is changed. Thus, the means of displaying which the maintenance condition of an indicative data decreases gradually exponentially is called the characteristic mold.

[0005] On the other hand, as shown in drawing 3 (a), an impulse mold is means of displaying which only a specific short time within 1 field period makes turn on the display screen, and is represented by CRT. By in the case of CRT, writing an indicative data in a fluorescent substance, and only very short time amount's emitting light, using the after-image effectiveness of human being's vision, and repeating after that the actuation which brightness decreases gradually, this method is the phase where each indicative data disappears, and expresses the motion with the continuous image reflected in human being's eyes as an after-image. Namely, when the field changes, the indicative data of the front field will already be disappeared. In addition, the means of displaying of a hold mold is a method held and displayed, without the once written-in indicative data decreasing almost as shown in drawing 3 (b), and it is represented by the plasma display panel (PDP) etc.

[0006] As mentioned above, in the means of displaying of an impulse mold, by making it not remain on the screen of the next field, the indicative data of the front field is recognized as an after-image only in human being's vision, and can also see the early animation of a motion without sense of incongruity. Therefore, the impulse mold is most suitable among each means of displaying mentioned above as a method which displays an animation, and it excels in animation display capacity so that clearly also from the display in CRT (television).

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] According to invention according to claim 1 or 4, it sets to a liquid crystal display, and is at two thirds of the time amount (data write-in allowed time) of 1 field period, Only the writing of all the indicative datas for one screen is performed on a liquid crystal display panel, and subsequently, by the 1/3 or less remaining time amount (luminescence authorization time amount) of 1 field period, since the means of displaying of an impulse mold is realized also in a liquid crystal display by performing only the luminescence display of the indicative data in which the back light was written as a lighting condition, animation display capacity can be raised. About all the scan lines scanned at 1 field period, since the luminescence authorization time amount which displays the picture signal written in the liquid crystal display panel according to invention according to claim 2 or 3 can indicate all the indicative datas by luminescence at coincidence by setting up so that it may be set as uniform time amount length and timing and may be in agreement with the lighting time amount of a back light, it can realize the display of an intermittent short time as well as the display by the motion-picture film continuously. Therefore, as compared with CRT which performs the scan display by the electron gun, animation display capacity can be raised further.
[0022] It is in general because of [of 1 field period] the ability to use the after-image effectiveness of human being's vision 1/3 or less and by setting it as 5 or less msecs in general about the luminescence authorization time amount which performs the luminescence display of the indicative data which was written in the liquid crystal display panel by making a back light into a lighting condition according to invention according to claim 5 or 6. Sense of incongruity in the conventional liquid crystal display to which coma delivery of the image is carried out can be prevented, and animation display capacity can be raised. And 1 field period is [1/3 or less and] in general because of the ability to make it able to respond to the luminescence authorization time amount of 5 or less msecs in general, and realize the luminescence display of an indicative data by having the device which changes the exposure of the exposure light to a liquid crystal display panel, and a cut off state at high speed, and controls them as a configuration of a back light based on the back light control signal supplied from a LCD controller according to invention according to claim 7. The means of displaying of an impulse mold is realizable good.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Since the means of displaying of a characteristic mold is adopted in the liquid crystal display as shown in drawing 4 as mentioned above, back light light is always irradiated. And an indicative data It is scanned sequentially from the upper scan line of a liquid crystal display panel (scan lines 1, 2, and 3, --, n), and writing is performed to a liquid crystal pixel, and shortly after writing is completed, a display display condition is held (the write-in (time amount n) -> display time (n)). Therefore, a screen display will always be rewritten one by one downward from on the screen, and especially, by the early animation of a motion, it is recognized as the image of the front field and the image of the next field lapping and appearing, and has the problem of sensing sense of incongruity to which coma delivery of the image is carried out. Then, this invention solves the problem mentioned above and aims at offering the liquid crystal display excellent in animation display capacity.

[Translation done.]

MEANS

[Means for Solving the Problem] The liquid crystal display panel by which, as for the liquid crystal display according to claim 1, two or more liquid crystal pixels were arranged in the shape of a matrix, Two or more scan lines and signal lines which connect said two or more liquid crystal pixels in a line writing direction and the direction of a train, The scan driver which is made to carry out the sequential shift of the predetermined scan signal, impresses, and scans said scan line sequentially, The signal driver which impresses a picture signal to said signal line, and the back light which irradiates exposure light from the tooth-back side of said liquid crystal display panel, In the liquid crystal display equipped with the inverter circuit which carries out the alternating current drive of said back light, and the drive control circuit which supplies the control signal which controls actuation of said scan driver, a signal driver, and an inverter circuit Said drive control circuit is characterized by only for the predetermined time amount within 1 field period turning on said back light, and displaying the picture signal written in said liquid crystal display panel by said scan driver and the signal driver.
[0009] Moreover, said predetermined time amount as which a liquid crystal display according to claim 2 displays the picture signal written in said liquid crystal display panel in the liquid crystal display according to claim 1 is characterized by being set as uniform time amount length and timing about said all scan lines scanned at said 1 field period. Moreover, a liquid crystal display according to claim 3 is set to a liquid crystal display according to claim 2. Said predetermined time amount which displays the picture signal written in said liquid crystal display panel is characterized by being set up so that it may be in agreement with the lighting time amount of said back light. Moreover, a liquid crystal display according to claim 4 is set to a liquid crystal display according to claim 3. Said drive control circuit is characterized by writing in all the picture signals for one screen at said liquid crystal display panel at periods other than said predetermined time amount within said 1 field period.
[0010] Furthermore, said predetermined time amount as which a liquid crystal display according to claim 5 displays the picture signal written in said liquid crystal display panel in a liquid crystal display according to claim 1 to 4 is characterized by the thing of said 1 field period set in general or less to 1/3. Moreover, said predetermined time amount as which a liquid crystal display according to claim 6 displays the picture signal written in said liquid crystal display panel in the liquid crystal display according to claim 1 to 4 is characterized by being set in general as 5 or less msecs. And a liquid crystal display according to claim 7 is characterized by said back light having the device which changes and controls the exposure of the exposure light to said liquid crystal display panel, and a cut off state based on said control signal supplied from said drive control circuit in a liquid crystal display according to claim 1 to 6.
[0011] namely, the liquid crystal display concerning this invention, if it is The time amount (luminescence authorization time amount) which turns on a back light and displays an indicative data (picture signal) It sets to below 1/3 (about 5 msec(s)) in general. 1 field period (1 / 60 seconds = 16.6msec) -- Moreover, make luminescence authorization time amount in agreement to all scan lines, and luminescence authorization time amount and the lighting time amount of a back light are made in agreement. Moreover, it is characterized by having the device which writes the indicative data for one screen in all liquid crystal pixels in field periods other than luminescence authorization time amount, and controls the lighting condition of a back light. Therefore, in two thirds of the time amount of 1 field period, only the writing of the indicative data to a liquid crystal pixel is performed (indicative-data write-in actuation), and the display of the indicative data by which the putting-out-lights condition was held and, as for the back light, the back light was subsequently written in it as a lighting condition by the 1/3 or less remaining time amount of 1 field period is performed (panel luminescence display action). By repeating the above display action for every field, intermittent means of displaying (impulse mold) is realized, and animation display capacity can be raised.
[0012]
[Embodiment of the Invention] The gestalt of operation of the liquid crystal display concerning this invention is explained with reference to a drawing. Drawing 1 is the outline block diagram showing 1 operation gestalt of the liquid crystal display concerning this invention. drawing 1 -- setting -- 10 -- a liquid crystal display panel and 20 -- a signal

driver and 30 -- for reversal amplifier and 60, as for common signal drive amplifier and 80, a LCD controller (drive control circuit) and 70 are [a scan driver and 40 / a RGB decoder and 50 / a back light and 90] an inverter circuit and a back light control circuit.

[0013] Each above-mentioned configuration is as follows [an outline]. The pixel electrode with which the liquid crystal display panel 10 has been arranged in the shape of a matrix, and the thin film transistor by which the source was connected to the pixel electrode (it is written as TFT below Thin Film Transistor;.), The scan line which extended to the line writing direction of a matrix and was connected to the gate of two or more TFT(s), and the signal line which extended in the direction of a train of a matrix and was connected to the source of two or more TFT(s) (it is also called a source line.) The common electrode with which the common signal Vcom which a pixel electrode is countered, and it is arranged and is mentioned later is impressed (it is also called a counterelectrode.) It has the liquid crystal with which it filled up between the pixel electrode and the common electrode, and is constituted.

[0014] Each signal line is connected to the signal driver 20, based on a level control signal, predetermined image data is memorized per one line, and sequential supply of the corresponding graphic display signal is carried out at each signal line. Moreover, each scan line is connected to the scan driver 30, based on a perpendicular control signal, sequential impression of the scan signal is carried out, it considers as a selection condition in a scan line, and the electrical potential difference of the graphic display signal supplied at the above-mentioned signal line is impressed to the pixel electrode of the location which crosses with the above-mentioned signal line. While supplying the RGB decoder 40 and the reversal amplifier 50 to the LCD controller 60 which extracts a perpendicular (V), and the clock signal and synchronizing signal (CSY) of a horizontal (H) from a video signal, and is mentioned later Each chrominance signal of the red (R) and green (G) which are contained in a video signal based on the field / Rhine reversal signal FRP outputted from the LCD controller 60, and blue (B) (it is hereafter called an RGB code.) It extracts, for example, changes into the digital RGB code of 8-bit each width of face, and a RGB reversal signal is supplied to the signal driver 20.

[0015] The LCD controller 60 generates above-mentioned field / Rhine reversal signal FRP based on the level clock signal (H), perpendicular clock signal (V), and synchronizing signal (CSY) which are supplied from the RGB decoder 40. While outputting to the reversal amplifier 50, by generating a level control signal and a perpendicular control signal, and supplying the signal driver 20 and the scan driver 30, a signal level is impressed to a pixel electrode to predetermined timing, and control which writes an indicative data in the liquid crystal display panel 10 is performed. The common signal drive amplifier 70 generates and outputs the common signal Vcom for driving the common potential impressed to the common electrode of the liquid crystal display panel 10 based on the field / Rhine reversal signal FRP outputted from the LCD controller 60 mentioned above.

[0016] A back light 80 is the linear light source of the cold cathode line fluorescent lamp arranged along the end side of a light guide plate (illustration is omitted) established in the tooth-back side of the liquid crystal display panel 10, and emits light to predetermined timing in the exposure light of predetermined brightness based on the alternating voltage for a drive supplied from the inverter circuit and the back light control circuit 90 mentioned later. Based on the back light control signal generated and outputted by the LCD controller 50, an inverter circuit and the back light control circuit 90 control actuation of an inverter circuit, and controls the lighting condition of a back light 80. Here, the back light control signal outputted from the LCD controller 60 is generated as a signal which synchronizes with write-in actuation of the indicative data based on the signal driver 20 and the scan driver 30 which were mentioned above, and is supplied to an inverter circuit and the back light control circuit 90. About the concrete control approach, it mentions later.

[0017] Next, concrete actuation of the liquid crystal display concerning this operation gestalt is explained with reference to a drawing. Drawing 2 is a timing diagram which shows actuation of the liquid crystal display concerning this operation gestalt.

(Indicative-data write-in actuation) All the indicative datas for one screen are first written in two thirds of the time amount (data write-in allowed time) of 1 field period at all liquid crystal pixels. That is, as shown in drawing 2 , an indicative data is written in each liquid crystal pixel of the 1st line by choosing the scan line 1 of the maximum upper part of the liquid crystal display panel 10 by the scan driver 30, and subsequently impressing a predetermined indicative data to a signal line by the signal driver 20. Hereafter, sequential-scanning Rhine 2, 3, and 4, --, n are scanned and chosen, and an indicative data is written in 2, 3, 4, --, each liquid crystal pixel of the n-th line through a signal line. Here, all the indicative datas written in data write-in allowed time are held with the pixel capacity which constitutes a liquid crystal pixel until 1 field period expires. Moreover, in data write-in allowed time, the back light 80 is held at the condition that it is held at the putting-out-lights condition, or exposure light was intercepted.

[0018] (Panel luminescence display action) After ending the writing of an indicative data in data write-in allowed time, where the indicative data written in all liquid crystal pixels is held, by changing a back light 80 into a lighting condition from the tooth-back side of the liquid crystal display panel 10, exposure light is irradiated and a luminescence display is carried out to the 1/3 or less remaining time amount (luminescence authorization time amount) of 1 field period. That

is, in the 1 field, the time amount length and lighting timing of lighting time amount of a back light 80 are equalized to all scan lines. Thus, since image display based on an indicative data is performed momentarily and the same indicative-data write-in actuation and the same panel luminescence display action are repeated also in the subsequent fields, intermittent image display is realized and only 1/3 or less time amount of 1 field period can acquire the after-image effectiveness equivalent to the means of displaying of an impulse mold. Therefore, as shown in the conventional technique, even if it is the case where a dynamic image is displayed, the image of the front field and the image of the next field lapping, and being recognized can be lost, and animation display capacity can be raised.

[0019] Next, the data write-in allowed time which specifies the indicative-data write-in actuation in this operation gestalt, and the luminescence authorization time amount which specifies a panel luminescence display action are explained. As mentioned above, in this operation gestalt, the case where set up two thirds of the time amount of 1 field period, and 1/3 or less time amount of 1 field period was set up as luminescence authorization time amount as data write-in allowed time was explained. Such each operating time is deeply related to human being's vision, as mentioned above. That is, generally, the response time of human being's eyes needs to carry out the display drive of the 1 field period by 5msec(s) (200fps), in order to realize the movie display which does not have sense of incongruity in the liquid crystal display concerning the conventional technique since it is called 5msec extent. Then, in this invention, by performing write-in control of an indicative data, and lighting control of a back light, 1 field period realizes the means of displaying of an impulse mold using the after-image effectiveness of human being's vision, when only 1/3 or less time amount (in general 5 or less msecs) for 1 / 60 seconds (about 16.6 msec(s)) turns on a back light and indicates the indicative data by luminescence.

[0020] In addition, in the liquid crystal display concerning this operation gestalt, in order to realize motion control as shown in drawing 2 , it is desirable to use high-speed lighting applied in the liquid crystal display of for example, a field sequential drive method as a configuration of a back light 80 and the thing excellent in high-speed responsibility. Moreover, you may have the shutter device which can change and control the exposure of the exposure light of a back light 80, and a cut off state by the high speed of 5msec extent as other configurations. Also in which configuration, it is controlled by the back light control circuit 90 to change a back light 80 from the time of going through two thirds of the time amount of 1 field period, or the time of the writing to all the liquid crystal pixels of all indicative datas being completed to a lighting condition synchronizing with write-in actuation of the indicative data based on the signal driver 20 and the scan driver 30 which are controlled by the LCD controller 60. In addition, in order to obtain display brightness comparable as the display brightness by the conventional means of displaying according to this operation gestalt, when the same liquid crystal display panel is used, it is needed to make the power which needs to raise the brightness of a back light at least 3 times, therefore is supplied to a back light increase to 3 or more times. Moreover, although the control which carries out drawing speed of an indicative data early is needed in order to shorten the write-in period of an indicative data to two thirds of the time amount of 1 field period, it is desirable to have the image memory for once storing all the indicative datas for one screen, changing into the frequency corresponding to the above-mentioned write-in actuation, and supplying the signal driver 20 etc.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the outline block diagram showing 1 operation gestalt of the liquid crystal display concerning this invention.
[Drawing 2] It is the timing diagram which shows actuation of the liquid crystal display concerning this operation gestalt.
[Drawing 3] It is drawing showing the relation between animation display capacity and means of displaying.
[Drawing 4] It is the timing diagram which shows actuation of the liquid crystal display concerning the conventional technique.
[Description of Notations]
10 Liquid Crystal Display Panel
20 Signal Driver
30 Scan Driver
40 RGB Decoder
50 Reversal Amplifier
60 LCD Controller
70 Common Signal Drive Amplifier
80 Back Light
90 Inverter Circuit and Back Light Control Circuit

[Translation done.]

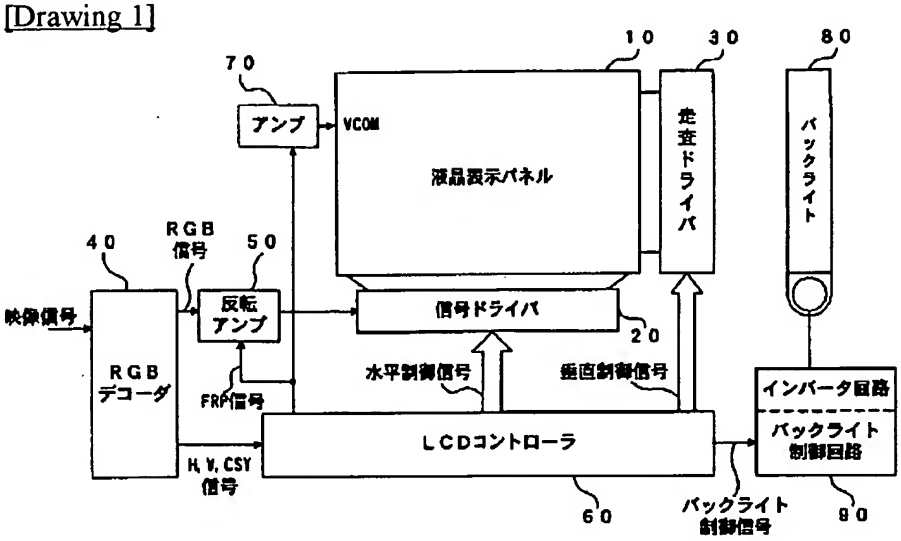
* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

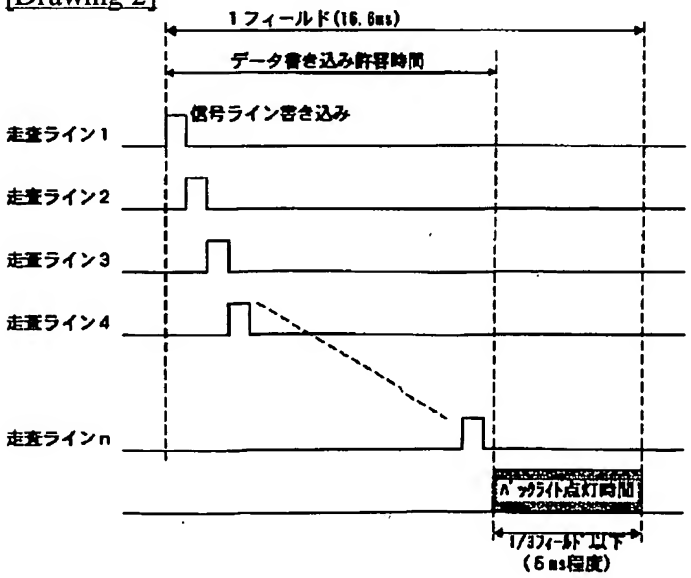
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

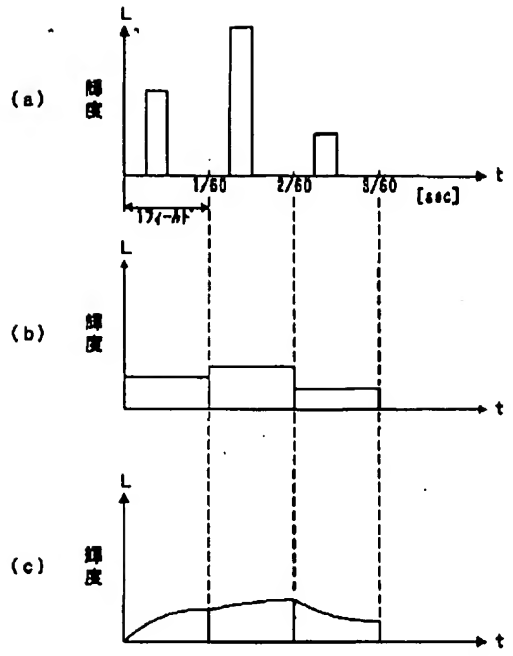
[Drawing 1]



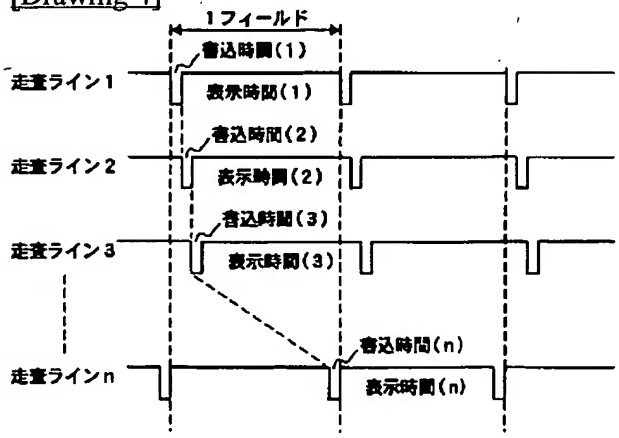
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]